

**WHAT IS CLAIMED IS:**

1. A bi-directional add/drop multiplexer (ADM) for transmitting a wavelength division multiplexed signal (WDMS) through an optical fiber in both forward and reverse directions at each node in a WDM network system, the ADM comprising,

a means for adding and dropping bidirectional signals;

wherein the channels of said forward direction and said reverse direction are interleaved, said interleaved optical signals are added/dropped according to channels, and said added/dropped bi-directional signals are de-interleaved into a forward optical signal and a reverse optical signal.

2. The bi-directional add/drop multiplexer as claimed in claim 1, further comprising:

a first interleaver having a first node, a second node, and a third node for interleaving said forward optical signal received at the first node and said reverse optical signal received at the second node, and for outputting said interleaved forward and reverse optical signals through the third node;

an add/drop multiplexer for adding and dropping a selected channel to/from the interleaved forward and reverse optical signals outputted from said first interleaver; and,

a second interleaver having a fourth node and a fifth node for de-interleaving optical signals outputted from said add/drop multiplexer into said forward optical signal and said reverse optical signal according to the channels, and for outputting said de-

interleaved forward optical signal and said de-interleaved reverse optical signal to the fourth and fifth nodes, respectively.

3. The bi-directional add/drop multiplexer as claimed in claim 2, further

5 comprising:

a first optical circulator for providing said forward optical signal to the first node of said first interleaver and for providing said reverse optical signal outputted at the first node of said second interleaver to said optical fiber; and,

10 a second optical circulator for providing said reverse optical signal to the second node of said first interleaver and for providing said forward optical signal output at the fifth node of said second interleaver to said optical fiber.

4. The bi-directional add/drop multiplexer as claimed in claim 2, further comprising:

15 first and second optical amplifiers provided to an input node and an output node of said add/drop multiplexer, respectively; and,

a dispersion compensation module, provided between the third node of said first interleaver and the input node of said add/drop multiplexer, for compensating color dispersion.

5. A bi-directional WDM optical transmission system comprising:

first and second transceivers for multiplexing a multi-channel optical signal before transmission and de-multiplexing a received multi-channel optical signal; and,

a bi-directional WDM-ADM for interleaving optical signal channels received from

5 said first transceiver and optical signal channels received from said second transceiver, for adding/dropping the interleaved optical signals according to channels, for de-interleaving the added/dropped optical signals into a first optical signal and a second optical signal, and providing the first and the second optical signals to said first and second transceivers, respectively.

6. The bi-directional WDM optical transmission system as claimed in claim

5, wherein the WDM-ADM comprises:

a first interleaver having a first node, a second node, and a third node for interleaving said forward optical signal received at the first node and said reverse optical signal received at the second node, and for outputting said interleaved forward and reverse optical signals through the third node;

an add/drop multiplexer for adding and dropping a selected channel to/from the interleaved forward and reverse optical signals outputted from said first interleaver; and,

a second interleaver having a fourth node and a fifth node for de-interleaving  
20 optical signals outputted from said add/drop multiplexer into said forward optical signal and said reverse optical signal according to the channels, and for outputting said de-interleaved forward optical signal and said de-interleaved reverse optical signal to the

fourth and fifth nodes, respectively.

7. The bi-directional WDM optical transmission system as claimed in claim 5, wherein the WDM-ADM comprises:

5 first and second optical amplifiers provided to an input node and an output node of the add/drop multiplexer, respectively; and,

a color dispersion compensation module provided between the third node of the first interleaver and the input node of the add/drop multiplexer.

10 8. A bi-directional WDM optical transmission system comprising:  
first and second transceivers for multiplexing a multi-channel optical signal before transmission and de-multiplexing a received multi-channel optical signal; and,

a WDM-ADM comprising;

15 a first interleaver having a first node, a second node, and a third node for interleaving said forward optical signal received at the first node and said reverse optical signal received at the second node, and for outputting said interleaved forward and reverse optical signals through the third node;

an add/drop multiplexer for adding and dropping a selected channel to/from the interleaved forward and reverse optical signals outputted from said first interleaver;

20 a second interleaver having a fourth node and a fifth node for de-interleaving optical signals outputted from said add/drop multiplexer into said forward optical signal and said reverse optical signal according to the channels, and for outputting said de-

interleaved forward optical signal and said de-interleaved reverse optical signal to the fourth and fifth nodes, respectively;

a first optical circulator for providing said forward optical signal to the first node of said first interleaver and for providing said reverse optical signal outputted at the first node of said second interleaver to said optical fiber; and,

a second optical circulator for providing said reverse optical signal to the second node of said first interleaver and for providing said forward optical signal output at the fifth node of said second interleaver to said optical fiber.

9. The bi-directional WDM optical transmission system as claimed in claim 8, wherein the WDM-ADM comprises:

first and second optical amplifiers provided to an input node and an output node of said add/drop multiplexer, respectively; and,

a dispersion compensation module, provided between the third node of said first interleaver and the input node of said add/drop multiplexer, for compensating color dispersion.